

## ABSTRACT

A distributed-feedback semiconductor laser as a direct modulation light source with a modulation rate over 10 Gb/s having (1) a low threshold current characteristic, (2) a high single-mode characteristic, (3) a high resonant frequency (fr) characteristic, (4) a high temperature characteristic, and (5) adaptability to wide wavelength band and an extremely short active region.

The distributed-feedback semiconductor laser 1 comprises an active region 30 for generating the gain of the laser beam and a diffraction grating 13 formed in the active region 30. Out of the two front and back end surfaces sandwiching the active region 30, the front end surface 1a has a reflectivity of 1 percent or less, and the back end surface 1b has a reflectivity of 30 percent or more when viewed from the back end surface 1b toward the front. The coupling coefficient  $\kappa$  of the diffraction grating 13 is  $100 \text{ cm}^{-1}$  or more, and the length L of the active region 30 is  $150 \mu\text{m}$  or less. A combination of  $\kappa$  and L provided that  $\Delta\alpha/g_{\text{th}}$  is 1 or more is used where  $\Delta\alpha$  is the gain difference between modes and  $g_{\text{th}} = (\text{internal loss } \alpha_i + \text{mirror loss } \alpha_m)$  is the threshold gain.